

**AN ANALYSIS OF THE *PSAIRONEURA TENUISSIMA* COMPLEX,
INCLUDING SYNONYMY OF *P. MACHADOI* DE MARMELS
WITH *P. BIFURCATA* SJÖSTEDT
(ZYGOPTERA: PROTONEURIDAE)**

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A review of the exclusively South American components of the genus *Psaironeura* Williamson shows that only 2 spp. are involved, *P. bifurcata* (Sjöstedt), and *P. tenuissima* (Selys). *P. machadoi* De Marmels is considered a synonym of *P. bifurcata*. Illustrations of the variability within the appendages, keys to ♂♂, and comments on the taxonomy of the group are included.

INTRODUCTION

WILLIAMSON (1915) proposed the genus *Psaironeura* to contain *Protoneura remissa* Calvert and his newly described species, *P. cerasina*. Since then, six names have been placed under this genus. *Psaironeura remissa* and *P. selvatica* Esquivel are largely dark metallic green species from Central America whose males possess broadly foliate cerci in lateral view. A third undescribed species similar to *P. remissa* is known from Panama, Venezuela, Colombia and Ecuador. The other four names have been applied to a series of entirely South American specimens, whose males possess semicircular cerci and are pale (thorax mostly red in life). The latter species names are the subject of this paper.

SELYS (1886) described *Protoneura tenuissima* from at least two pairs from "Pebas, Teffé (Amazone). Coll. Selys." of which a lectotype was selected by MACHADO (1985). WILLIAMSON (1915) described *Psaironeura cerasina* from one male from Wismar, British Guiana. He described this species in life as "a delicate and beautiful insect, the

* I dedicate this paper Dr M.W. Moore for his contributions to Odonata conservation.

translucent red parts of the thorax and especially the abdomen suggesting the specific name". In his key to species, Williamson placed *P. cerasina* near *P. tenuissima* diagnosing the latter by reference to Selys' description of the cercus. In a footnote, Williamson noted that "*Tenuissima* Selys from the Amazon is known to me only from description; both sexes are known. In coloration it is scarcely distinguishable from *cerasina*".

SJÖSTEDT (1918) described and illustrated *Protoneura bifurcata* based on two males from Manaus, Brazil. In the description, he stated that the new species: "stands in form and color very near *tenuissima*, but having entirely different cerci. The hind lobe of the prothorax is orange red, becoming somewhat metallic blue, not entirely black". The two specimens were noted in the original description as "Living in the forest (Roman)".

SANTOS (1968), provided several venational statistics for 16 males of "*Psaironeura cezasina* [*sic*: should be *cerasina*]" from the Río Jatun Yacu and Partidero areas of Ecuador. All of the material cited was collected in 1935-1936 by William Clark-MacIntyre, a professional collector who supplied Odonata to C.H. Kennedy (KENNEDY 1936, 1937, 1938) and L.K. Gloyd (WOYTKOWSKI 1978).

Based on comparison of the types, MACHADO (1985) demonstrated that *P. cerasina* is a junior synonym of *Protoneura tenuissima*. MACHADO (1985: 214) discussed the ambiguity of the type locality of *Protoneura tenuissima* ("Patri: Pebas, Teffé [Amazonia]"), indicating that "the type locality of *P. tenuissima* cannot be precisely located (not even for the country) although it is certainly in the upper Amazon region [of Peru or Brazil]". He also showed that *Protoneura tenuissima* is a true *Psaironeura*, thus justifying Williamson's (1915) placement of this species into *Psaironeura*. Under the taxonomic discussion, Machado (1985) remarked that *P. tenuissima* was conspecific with an Amazonian species that both SANTOS (1968) and he had identified as *Psaironeura cerasina* Williamson, 1915, and further that "Santos (1968) studied the venation based on the examination of 16 males".

DE MARMEELS (1989) described *Psaironeura machadoi* based on 10 males and four females from Territorio Federal, Amazonas region, in southern Venezuela. He diagnosed the new species from *P. tenuissima* but admitted that differentiation from *P. bifurcata* was "more problematic". DE MARMEELS (1989) provided several color and morphological differences in the cerci by comparing *P. machadoi* with a topotypical male of *P. bifurcata* loaned to him by Prof. A.B.M. Machado. He illustrated the caudal appendages of *P. bifurcata*, *P. machadoi*, and *P. tenuissima*, the last species from Belém, Brazil.

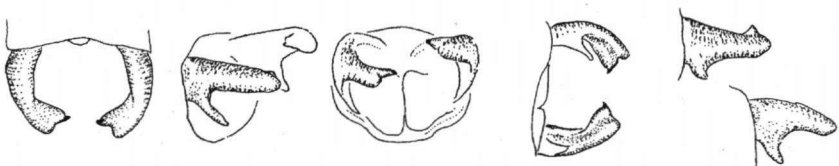
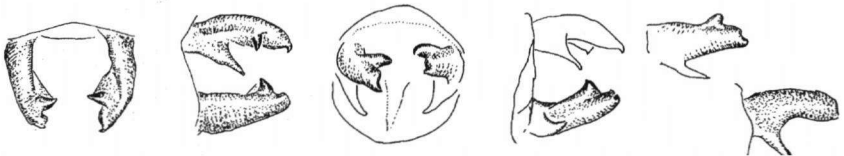
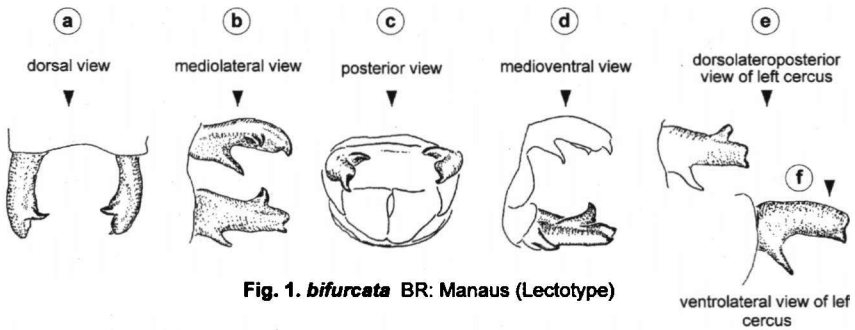
Several years ago, I examined specimens of *Psaironeura* from Vila Murtinho, Rondônia State (Fig. 4d) and Rio Xingu Camp (Fig. 4a), Pará State, Brazil. The tips of their cerci were unlike any previous illustrations for *P. tenuissima*, and I thought that they might represent a new species. The tips of the cerci in the specimens are almost entirely rounded, and they possess only a well-defined medially directed tooth. Several years later, I examined many specimens of *P. tenuissima* from Ecuador, Peru, and Brazil, and noticed that the tips of the cerci were variable, both within and between localities (Fig. 4). It soon appeared that an examination of material, including types of all four names, would be necessary in order to assign specimens in my collection to published names.

RESULTS AND DISCUSSION

Through the kindness of Per Inge Persson, I was able to examine the syntypes of *Protoneura bifurcata* Sjöstedt. Dr J. De Marmels kindly gave me a paratype of *P. machadoi*, and I was able to examine the holotype of Williamson's *P. cerasina* as well as a homotype of *P. tenuissima* given to UMMZ. From an examination of these, including another 149 males and 9 females of South American *Psaironeura*, I believe that only two species, *P. tenuissima* and *P. bifurcata*, are valid. I have been unable to differentiate females of these two closely related species based on material I have examined. Males of the two species of *Psaironeura* from South America may be differentiated by the following key:

KEY TO MALES

- 1 Tip of cercus in dorsal or posteromedial view branched, both external and internal branch armed with distinct black tooth (Figs 1,2, 4i-n); Amazonian Ecuador and N Peru east to S Venezuela and Manaus, Brazil (Fig. 5) *bifurcata*
- Tip of cercus in dorsal or posteromedial view either branched (Fig. 3, 4f-h) or bluntly rounded (Fig. 4a) the external branch or lobe, if present, never with a black tooth; central South America (Fig. 6) *tenuissima*



PSAIRONEURA BIFURCATA (SJÖSTEDT)

Figures 1-2, 4i-n, 5

Protoneura bifurcata SJÖSTEDT, 1918: 28 (description of 2 ♂ from Manaus, Brazil)*Psaironeura bifurcata* DE MARMELS, 1989: 26 (notes on topotype ♂)*Psaironeura machadoi* DE MARMELS, 1989: 25 (description of ♂ and ♀ from Amazonas State, Venezuela) **new synonymy**

The type series consists of two males one of which lacks the tip of the abdomen. I select as lectotype the other male whose appendages I illustrate here. The tip of the cercus in the lectotype (Fig. 1, 4m) shows the presence of a well-developed anteapical medially directed tooth similar to the topotype male illustrated by DE MARMELS (1989: 65). Examination of a large series of males from Ecuador and a few from Peru (Fig. 5) show the characteristic bidentate condition of the tip of the cercus. The medially directed anteapical tooth, though variable in size and location in the series I examined, was always present on both right and left cercus. A paratype of *P. machadoi* (Figs 2, 4n) showed the strongest development of the anteapical tooth.

DE MARMELS (1989) contrasted the morphological differences of a topotype *P. bifurcata* with *P. machadoi* as follows: "Internal tooth of the superior anal appendages is large and strongly chitinized, resembling a strong hook sitting on a comparatively

small base....while in *P. machadoi* this tooth is less extensively chitinized and appears as a smaller hook on a larger base." However, my paratype of *P. machadoi* displays a more pronounced anteapical tooth (Fig. 4n) compared to the lectotype of *P. bifurcata* (Fig. 4m) and both specimens have a more pronounced anteapical tooth compared to those from Ecuador and Peru (Figs 4i-l). De Marmels also contrasted the extent of dark metallic thoracic coloration of *P. machadoi* compared to *P. bifurcata* but specimens from Ecuador and Peru are variously colored; some have an entirely metallic prothoracic hind lobe while others have the lateral third or less pale. The middorsal thoracic metallic green in these specimens extends laterally as far as or further than in the topotype of *P. machadoi*.

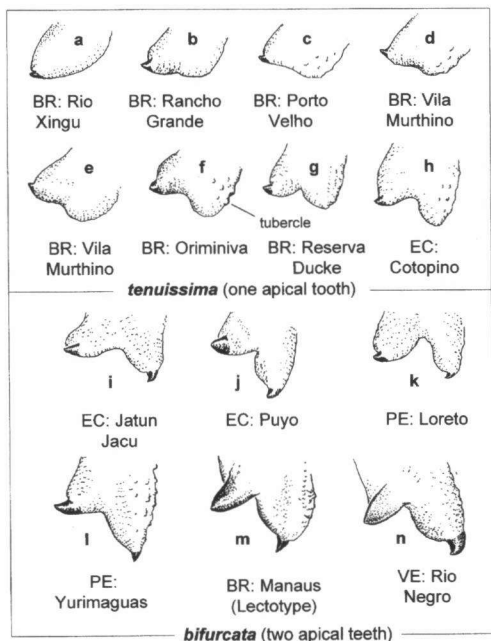


Fig. 4. Tip of right cercus (dorsal view) of *Psaironeura tenuissima* and *P. bifurcata*.

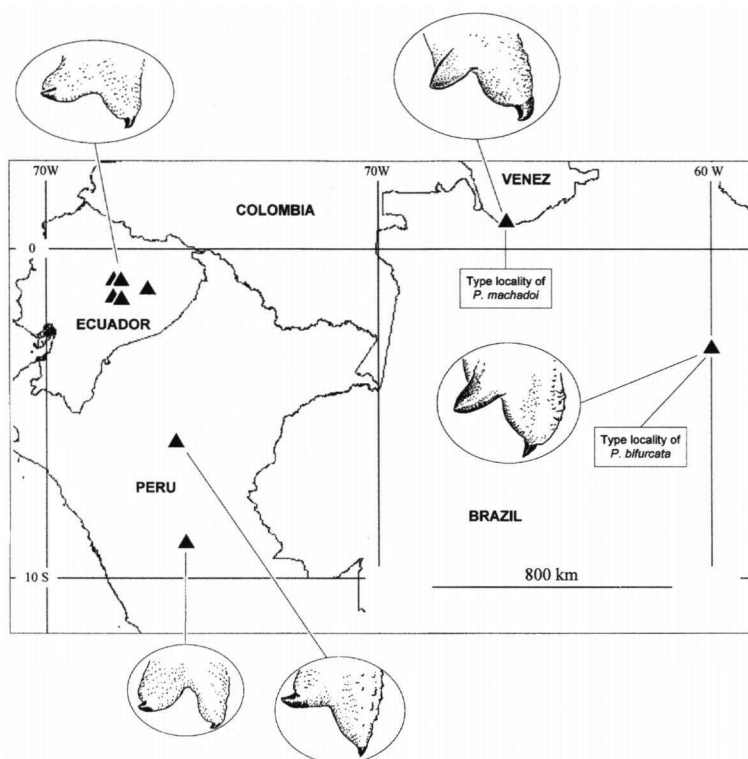


Fig. 5. Distribution of *Psaironeura bifurcata*.

Because of the variability within the morphology of the cercus and degree of metallic coloration, I consider *P. machadoi* a junior synonym of *P. bifurcata*. The specimens identified by SANTOS (1968) as "*Psaironeura cerasina* (= *tenuissima*)" from the Río Jatun Yacu and Partidero areas of Ecuador are part of the same lot of specimens I have identified as *P. bifurcata*.

The extraordinary variability of the tip of the cercus of *P. bifurcata* and especially of *P. tenuissima*, at first suggested that only one species might be involved; however, the lack of specimens with an intermediate condition of the anteapical tooth (e.g. present on one cercus and not the other) and the near sympatry of both in Ecuador and Manaus, Brazil (Figs 5-6) convinced me that there are two species.

Psaironeura bifurcata occurs from central Ecuador (Napo prov., Río Shicai Yacu, approx. 1°5'S, 78°4'W) north through southern-most Venezuela (Amazonas State, Río Baria (Neblina Base Camp), 0°49'N, 66°9'W, type locality of *P. machadoi*), west to Pará State (Manaus, 3°6'S, 60°0'W), and south to central Peru (Loreto Dept., Boqueron del Padre Abad, NE of Tingo Maria, approx. 8°58'S, 75°50'W) at elevations ranging from near sea level (Manaus, 100 m) to 981 m (Ecuador, Pastaza Prov., Puyo, Rio Pastaza watershed, approx. 1°28'S, 77°59'W).

PSAIRONEURA TENUISSIMA (SELYS)

Figures 3, 4a-h, 6

Protonevra tenuissima Selys, 1886: 217 (description of 2 ♂, 1 ♀ from "Pebas, Teffé, Amazone")

Psaironeura cerasina Williamson, 1915: 629 (description of ♂ from Wismar, British Guiana), Machado 1985: 213 (synonymy with *P. tenuissima*)

Psaironeura tenuissima Williamson, 1915: 620 (assignment of *Protonevra tenuissima* to *Psaironeura*)

This species, which has a more extensive range than does *P. bifurcata*, displays an extraordinary degree of variation in the tip of the cercus (Figs 4a-h). The external apical tooth present in *P. bifurcata* is lacking in this species. A well-developed external tubercle (Figs 4f-h) is present in some populations but the degree of development does not seem to correlate to geography (Fig. 6). Like DE MARMELS (1989), I have found no differences in the genital ligula between *P. bifurcata* and *P. tenuissima*.

Psaironeura tenuissima occurs from central Ecuador (Napo Prov., Río Cotopino [?Río Cotopino, between Napo and Aguaricos], approx. 1°0'S, 78°42'W) north through Guy-

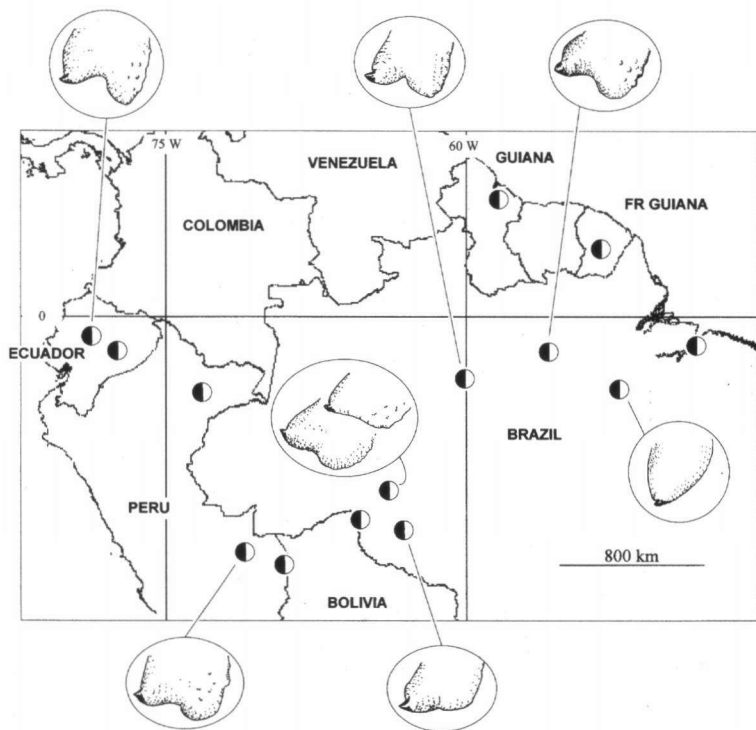


Fig. 6. Distribution of *Psaironeura tenuissima*.

ana (Wismar, 6°0'N, 58°18'W, type locality of *P. cerasina*) and French Guiana (Saint Laurent du Maroni, Saul, access to airport, approx. 3°32'N, 53°15'W) west to Pará State (Belém, 1°27'S, 48°29'W), and south to SE Peru (Madre De Dios Dept., sandy forest stream near Explorer's Inn on Rio Tambopata E bank 30 km SW of Puerto Maldonado, approx. 12°37'S, 69°11'W) at elevations ranging from near sea level (Belém, 100 m) to 400 m (Ecuador, Napo Prov., Río Cotopino).

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